

# THE NAMURIAN GONIATITE *NUCULOCERAS* *STELLARUM* (BISAT)

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ABSTRACT. The goniatite previously known as '*Cravenoceratoides stellarum*' is spirally ornamented and usually possesses a small umbilicus. The early Homoceratina are best classified at generic level in terms of ornament and *stellarum* should be included in the genus *Nuculoceras*. English material is described and comparison made with foreign descriptions of the species. A revision of zonal classification in the Arnsbergian Stage (E2) of the Namurian is proposed.

*Nuculoceras stellarum*, originally described by Bisat (1932) from Gill Beck, Cowling, Yorks, occurs at a single horizon in the English shale-sandstone development of the Namurian Series. The band containing the goniatite is thus a valuable marker horizon in stratigraphical studies. Unfortunately the original description of *N. stellarum* is somewhat inadequate and during recent work it has become apparent that neither Bisat's description nor the amplified description given by Hudson (1946) brings out the most important diagnostic features of the species or allows a clear distinction to be made between *N. stellarum* and the rather closely allied species *Cravenoceratoides nititoides* (Bisat) and *N. nuculum* Bisat. As the horizon of *Ct. nititoides* is immediately below *N. stellarum* and three horizons with *N. nuculum* (Ramsbottom *et al.* 1962, p. 130) immediately succeed the *N. stellarum* band there is some difficulty at present in distinguishing between three important levels in the Namurian succession. *Ct. nititoides* has been redescribed and figured (Yates 1962, p. 391, pl. 57, figs. 4, 5) and it is desirable that *N. stellarum* should also be redescribed.

The present description is based upon three collections:

Collection 1. Small suite of specimens completely crushed in hard limestone, Upper Dove Valley, south-west Derbyshire, Grid Ref. SK 08666631 (Locality 326—Holdsworth 1963).

Collection 2. Suite of specimens crushed and partially crushed in decalcified silty limestone lying 13 feet above the horizon of *Eumorphoceras rostratum* Yates and 25 feet above *Cravenoceras holmesii* Bisat, Oakenclough Brook, north-east Staffordshire, Grid. Ref. SK 05046368 (Locality 206c—Holdsworth 1963).

Collection 3. Topotypes of *N. stellarum*, Geological Survey of Great Britain collection, Leeds Office, Nos. Da 1626-60.

## SYSTEMATIC DESCRIPTION

Order AMMONOIDEA Zittel 1884  
Suborder GONIATITINA Hyatt 1884  
Superfamily GONIATITACEA de Haan 1825  
Family GONIATITIDEA de Haan  
Subfamily HOMOCERATINA Spath  
Genus NUCULOCERAS Bisat 1924

*Type species. Nuculoceras nuculum* Bisat 1924.

*Diagnosis.* Early Homoceratina with ventral lobe of suture narrower than in *Homoceras*. Conch involute, subglobose with small or very small umbilicus. Shell surface bears bifurcating transverse ribs and subsidiary spiral ornament.

*Nuculoceras stellarum* (Bisat)

Plate 25, figs. 1–6

- 1927 *Homoceras cf. nitidum* (Phillips), Bray, p. 55.  
 1932 *Cravenoceras stellarum* Bisat, pp. 33–34, pl. 2, fig. 1.  
 1934 *Cravenoceras stellarum* Bisat; Schmidt, p. 450, fig. 46.  
 1934 ? *Cravenoceras nititoides* Bisat; Schmidt, p. 450, fig. 47.  
 1941 *Cravenoceras stellarum* Bisat; Demanet, p. 144, pl. 6, figs. 9, 10.  
 1941 *Cravenoceratoides stellarum* (Bisat); Hudson, p. 282, footnote.  
 1946 *Cravenoceratoides stellarum* (Bisat); Hudson, p. 380, pl. 21, fig. 9.

The true original shape of the shell is impossible to determine in the available material, but is probably subglobose (Hudson 1946, p. 380). The ratio of umbilicus diameter to diameter of the crushed shell ( $u/d$ ) is variable but, except in the very early growth stage, usually exceeds 4.0—i.e. the umbilicus is relatively small.

	<i>Specimen</i>	<i>Shell diameter</i>	<i>Umbilicus diameter</i>	$u/d$
Collection 1	326.2	> 11.0 mm.	1.5 mm.	> 7.33
	326.3	> 19.0	4.0	> 4.75
	326.1	> 25.0	5.0	> 5.00
Collection 2	206c.1	4.0	1.0	4.00
	206c.4	9.0	1.5	6.00
	206c.2	> 16.0	< 2.0	> 8.00
	206c.3	≥ 28.0	6.0	≥ 4.70
Collection 3	Da.1631	6.0	ca. 1.0	6.00
	Da.1639	10.0	2.0	5.00
	Da.1632	ca. 11.0	2.0	5.50
	Da.1628	> 16.0	2.5	> 6.40
	Da.1642	> 20.0	3.0	> 6.60
	Da.1637	> 25.0	6.5	> 3.84
	Da.1629	ca. 26.0	5.0	5.20

At 4.0 mm. diameter the shell is evolute. At 9.0 mm. the typical narrow umbilicus has been assumed. Ribs with spacing *c.* 4 per mm. at the venter have a very slight forward tendency at the umbilicus (Pl. 25, fig. 6). Neither umbilical rim nor spiral ornament appear to be developed, and at this growth stage there is a similarity with the adult *Ct. nititoides* (cf. Yates 1962, pl. 57, figs. 4, 5). At diameter slightly greater than 16.0 mm. the 'nititoides aspect' is lost. Rib direction now appears essentially truly radial with spacing *c.* 5 per 2 mm. at the venter. Ribs are symmetrical (tented) in elevation and the external mould clearly displays spiral corrugation of inter-rib areas. Though hardly ever detectable on shell surfaces, this spiral ornament can frequently be seen on good external moulds of the adult flank (Pl. 25, fig. 3) and venter (fig. 4). Almost invariably ribs appear non-crenulate on shell surfaces and crenulation is not detectable on external moulds. Only on a few shell sectors of Specimen 326.1 is a faint, rather broad crenulation of ribs

detectable. The umbilical margin in the adult is very frequently raised into a rounded rim across which the ribs pass without weakening. The feature is particularly clear on Specimens Da 1629 and Da 1637 (Pl. 25, fig. 2) and the rim imprint is commonly seen on external moulds (Pl. 25, fig. 5).

*Discussion.* The holotype of *N. stellarum* has u/d ratio 3.6 at diameter 18 mm. and in view of the measurements made on topotypes (Collection 3) appears to be untypical of the species at the Gill Beck locality. There is no reason to believe, therefore, that the 'similar form, but with a smaller umbilicus' recorded by Bisat (1932, p. 34) from Glutton Bridge, Derbyshire—possibly the locality of Collection 1—is 'a late form of the species'.

*N. stellarum* is distinguished from *Ct. nititoides* and all true *Cravenoceratoides* (see below) by its weak, rather coarse spiral ornament. In collections of moderate preservation, traces of this ornament and the presence of the raised umbilical rim are the most useful criteria for distinguishing *stellarum* from *nititoides*. In small specimens of *stellarum* neither feature seems to be developed and distinction between *stellarum* and *nititoides* cannot be made with certainty. *N. nuculum* is a smaller species than *stellarum*, 'the adult being apparently not more than 18 mm.' in diameter (Bisat 1924, p. 100). *Nuculum* lacks the raised umbilical rim of *stellarum* at the shell surface, though a rim is sometimes apparent on the solid internal cast. In shale, mudstone, and fissile limestone the spiral ornament of *nuculum*, in contrast to that of *stellarum*, is seldom detectable on either shell surfaces or external moulds. Conversely, the crenulation of transverse ribs—so very rarely visible on *stellarum*—can usually be detected on *nuculum* specimens in a similar state of preservation.

#### *The generic assignment of stellarum*

The genus *Nuculoceras* was founded by Bisat (1924, p. 100) with *nuculum* as type species and sole member. Spiral ornament and globose conch are the two features mentioned in the generic diagnosis. Bisat (1928, p. 132) erected the genus *Cravenoceras* to include 'early *Homoceras*-like forms' having a suture with ventral lobe narrower than in *Homoceras* proper, two of which forms—*malhamense* and *nitidum*—had earlier (Bisat 1924) been included in *Homoceras*. Hudson (1914, p. 282, footnote) restricted the name

#### EXPLANATION OF PLATE 25

- Fig. 1. *Nuculoceras stellarum* (Bisat), external mould of specimen crushed in hard limestone with some small areas of shell-surface, slightly displaced. Specimen shows small umbilicus, essentially truly radial ribs, weak imprint of umbilical rim and traces of spiral ornament. Upper Dove Valley, Derbyshire. 326.1,  $\times 4.4$ .
- Fig. 2. *Nuculoceras stellarum* (Bisat), shell-surface of topotype crushed in mudstone and showing raised umbilical rim; Gill Beck, Yorkshire. Da 1637,  $\times 3.2$ .
- Fig. 3. *Nuculoceras stellarum* (Bisat), detail of external mould showing spiral ornament. 326.1,  $\times 6.0$ .
- Fig. 4. *Nuculoceras stellarum* (Bisat), external mould of venter with shell patina, showing spiral ornament; Oakenclough Brook, Staffordshire. 206c.7,  $\times 6.0$ .
- Fig. 5. *Nuculoceras stellarum* (Bisat), external mould of umbilical fragment, showing imprint of umbilical rim; Oakenclough Brook, Staffordshire. 206c.8,  $\times 5.0$ .
- Fig. 6. *Nuculoceras stellarum* (Bisat), external mould of small adolescent showing 'nititoides-aspect'; Oakenclough Brook, Staffordshire. 206c.4,  $\times 7.8$ . (Owing to a common optical illusion the ribs appear, in the photograph, to be preserved in relief. In fact the specimen is a mould and the true appearance can be obtained by inverting the figure.)



2



3



4



6



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